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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁵ : C02F 1/48</p>	<p>A1</p>	<p>(11) International Publication Number: WO 93/08127 (43) International Publication Date: 29 April 1993 (29.04.93)</p>
<p>(21) International Application Number: PCT/GB92/01966 (22) International Filing Date: 26 October 1992 (26.10.92) (30) Priority data: 9122618.3 24 October 1991 (24.10.91) GB (71) Applicant (for all designated States except US): PATENTS PENDING LIMITED [GB/GB]; Buxton Court, 3 West Way, Oxford OX2 0SZ (GB). (72) Inventor; and (75) Inventor/Applicant (for US only) : DODD, Eric [GB/GB]; Greensleeves, Old Ross Road, Whitchurch, Near Ross- on-Wye, Hereford HR9 7DD (GB). (74) Agent: GIBSON, Stewart, Harry; Urquhart-Dykes & Lord, Business Technology Centre, Senghennydd Road, Car- diff CF2 4AY (GB).</p>		<p>(81) Designated States: AT, AU, BB, BG, BR, CA, CH, CS, DE, DK, ES, FI, GB, HU, JP, KP, KR, LK, LU, MG, MN, MW, NL, NO, PL, RO, RU, SD, SE, US, Euro- pean patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, SN, TD, TG).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: FLUID TREATMENT APPARATUS</p> <div data-bbox="474 1136 1235 1703"> </div> <p>(57) Abstract</p> <p>An apparatus for treating conditioning or purifying water or other fluid comprises a duct (10) through which the water or other fluid flows, an electromagnetic coil (12) and a drive circuit (14) for feeding alternating current of frequency 50 to 60 hz through the coil, to create an alternating magnetic field within and axially of the duct. A unidirectional magnetic field is also provided within and axially of the duct, and may be provided by a permanent magnet or by a direct current fed through the coil.</p>		

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This invention relates to an apparatus for treating, conditioning or purifying water or other fluid (including liquid or gas).

As is well known, water carries various minerals or salts, e.g. calcium carbonate, magnesium compounds and iron, in solution: "hard" water has large quantities of these compounds and they are liable to come out of solution and form scale on the internal surfaces of domestic and other equipment. Various attempts are made to remove these compounds and thereby "soften" the water. Also water commonly carries bacteria which are liable to multiply and efforts are made to treat water to alleviate this problem.

I have now devised an apparatus which is able, in a relatively simple and effective manner, to purify or condition water or other fluids.

In accordance with this invention, there is provided an apparatus for treating, conditioning or purifying water or other fluid, the apparatus comprising a duct for the water or other fluid to flow through, an electromagnetic coil and drive means for feeding an alternating current of frequency in the range of 50 to 60 hz through said coil, the coil being arranged to create an alternating magnetic field within and axially of the duct, the apparatus further being arranged to create or permit a unidirectional magnetic field within and axially of the duct.

The coil which is fed with alternating current may be wound around the duct. The unidirectional magnetic field may be created by a direct current fed through this coil, with the alternating current superimposed on it. In this arrangement, preferably the unidirectional magnetic field is in the range of 100 to 200 gauss and preferably it is selected (or adjusted) equal or slightly exceed the local strength of the earth's magnetic field. Preferably the rms value of the alternating component of the axial magnetic field in the flow duct is approximately 4 times the value of the unidirectional component. Preferably in this arrangement the fluid flow through the duct is pulsed.

In another arrangement, the coil which is fed with

alternating current is positioned to one side of the duct and with its axis transverse to and intersecting the duct. The magnetic field produced by this coil includes a portion of magnetic field beyond the end of the coil and transverse to its own axis, but axial of the duct. Preferably the alternating current which is fed to this coil is modulated by a signal of 5% lower frequency. The unidirectional magnetic field within the duct may be produced by a second coil wound around the duct and fed with a direct current, or by a permanent magnet.

10 Preferably the arrangements which have been described include a shield so that the duct (or at least the length thereof experiencing the alternating magnetic field) is shielded from the earth's magnetic field. Alternatively, the apparatus may be oriented so that its duct is aligned with the earth's magnetic field, in which case the earth's magnetic field is used as the unidirectional field within the duct.

Also in accordance with this invention, there is provided a process for treating, conditioning or purifying water or other fluid, which comprises passing the water or other fluid through a flow duct whilst within the duct an axial magnetic field is created, said axial magnetic field having a unidirectional component and an alternating component of frequency in the range of 50 to 60 hz.

I have found that, for example in treating water, the apparatus and process of this invention act to cause dissolved or suspended minerals or salts to flocculate (therefore preventing them from crystallising), such that they can be removed by filtration. Also, bacteria are found to revert to single-cell form, in which they are harmless. It is believed that the apparatus and process cause dissociation of the water into the free radicals OH (hydroxyl) and OH₃ (hydronium), and then the alternating magnetic field "tunes" these ions in accordance with principles known from the cyclotron ion resonance effect, before the water molecules reform. It is further believed that only a small proportion of the water molecules are modified or "tuned" in this manner, but that subsequently other molecules become similarly tuned through association with them. In this manner, the water becomes reset to a natural balance.

Similar effects may be achieved by the use of electric fields instead of magnetic fields. Thus, also in accordance with this invention there is provided an apparatus for treating, conditioning or purifying water or other fluid, the apparatus comprising a duct for the water or other fluid to flow through, a pair of electrodes spaced apart across the duct, and drive means for applying a voltage across the electrodes consisting of a unidirectional component having superimposed on it an alternating component of frequency in the range of 50 to 60 hz.

Further in accordance with this invention, there is provided a process for treating, conditioning or purifying water or other fluid, which comprises passing the water or other fluid through a flow duct whilst within the duct a transverse electric field is created, the transverse magnetic field having a unidirectional component and an alternating component of frequency in the range 50 to 60 hz.

Embodiments of this invention will now be described by way of example only and with reference to the accompanying drawings, in which:

FIGURE 1 is a diagrammatic longitudinal section through one embodiment of apparatus in accordance with this invention;

FIGURE 2 is a diagrammatic longitudinal section through a second embodiment of apparatus in accordance with this invention; and

FIGURE 3 is a diagrammatic cross-section through a third embodiment of apparatus in accordance with this invention.

Referring to Figure 1 of the drawings, there is shown an apparatus for treating, conditioning or purifying water or other fluids. The apparatus comprises a duct 10 along which the water or other fluids flows. The apparatus further comprises a coil 12 wound or positioned around the flow duct 10. A drive circuit 14 superimposes an alternating current on a direct current and feeds the resultant through the coil 12. The current in the coil 12 creates an axial magnetic field in the flow duct, having a unidirectional component and an alternating component. Preferably the unidirectional component is adjusted to equal or slightly exceed the local strength of

the earth's magnetic field, and is therefore adjustable in the range of 100 to 200 gauss. The alternating current has a frequency in the range of 50 to 60 hz and is preferably adjustable in frequency within this range. Preferably the
5 alternating current is adjustable to adjust the alternating magnetic field component so that its rms value is approximately 4 times the unidirectional component.

In the apparatus of Figure 1, the unidirectional magnet field may be provided by a permanent magnet, instead of by
10 feeding the direct current to the coil 12.

Preferably the apparatus includes a shield 16 so that the length of duct 10 within the coil is shielded from the earth's magnetic field. Alternatively the apparatus may be oriented with the flow duct aligned with the earth's magnetic
15 field: in this case the apparatus is not required to generate the unidirectional component of magnetic field within the duct.

We have found it preferable for the flow of water or other fluid through the duct 10 to be pulsed: for this purpose a pump may be connected to the inlet end of the duct 10.

20 Typically the duct 10 may have an internal diameter of the order of 30mm, carrying water at a flow rate of 1200 gallons per hour, and the coil 12 is typically of the order of 40mm long, consisting of typically 1200 to 1500 turns of wire, having a unidirectional current component of 0.5 amps from a
25 28 volt supply.

Referring to Figure 2, there is shown a modified apparatus comprising a flow duct 10 and a coil 12 wound or positioned around it. A direct current is fed through the coil 12 from a drive circuit 14, to produce a unidirectional
30 magnetic field H within and axially of the duct 10. A second coil 13 is wound around part of the coil 12, to one side of the duct, the axis of the coil 13 being perpendicular to and intersecting the axis of coil 12. An alternating current is fed through the coil 13 from the drive circuit 14: as indicated
35 by the lines of flux shown in the drawing, an alternating magnetic field H_1 , H_1 is produced axially within the duct 10. The alternating current which is fed to coil 13 has a frequency f_0 within the range of 50 to 60 hz, and is modulated, with a 50% depth of modulation, by an alternating signal of frequency

f_1 5% less than f_0 .

As in the apparatus of Figure 1, preferably the apparatus of Figure 2 includes a shield, or alternatively it may be oriented with the flow duct aligned with the earth's magnetic field.

The duct 10 and coil 12 of the apparatus of Figure 2 have similar parameters to those of the duct 10 and coil 12 of Figure 1: however, the apparatus can carry water at a flow rate up to 6000 gallons per hour.

Referring to Figure 3, there is shown an alternative form of apparatus in accordance with this invention, comprising a pair of planar electrodes 22,24 mounted parallel to each other adjacent opposite sides of a flow duct 20 and connected to an electrical power source 26. The source 26 applies across the electrodes 22,24, to create an alternating electric field E across the duct 20: this voltage comprises an alternating component, at a frequency of 50 to 60 hz, superimposed on a unidirectional component. The flow of water or other fluid through the duct may be pulsed, as described above.

CLAIMS

- 1) An apparatus for treating, conditioning or purifying water or other fluid, the apparatus comprising a duct for the water or other fluid to flow through, an electromagnetic coil
5 and drive means for feeding an alternating current of frequency in the range of 50 to 60 hz through said coil, the coil being arranged to create an alternating magnetic field within and axially of the duct, the apparatus further being arranged to create or permit a unidirectional magnetic field within and
10 axially of the duct.
- 2) An apparatus as claimed in claim 1, in which the coil which is fed with alternating current is wound around the duct.
- 3) An apparatus as claimed in claim 2, in which the drive means is arranged to pass a direct current through said coil,
15 on which the alternating current is superimposed.
- 4) An apparatus as claimed in any one of the claims 1 to 3 further comprising means to cause the flow of fluid through said duct to pulse.
- 5) An apparatus as claimed in claim 1, in which the coil
20 which is fed with alternating current is positioned to one side of the duct with its axis transverse to and intersecting said duct.
- 6) An apparatus as claimed in claim 5, in which the drive means is arranged to modulate the alternating current fed to
25 said coil, by a signal of 5% lower frequency.
- 7) An apparatus as claimed in claim 5 or 6, comprising a second coil which is wound or positioned around the duct and fed with direct current from said drive means.
- 8) An apparatus as claimed in any preceding claim,
30 including a shield which exclude's the earth's magnetic field from a length of said duct in which the alternating magnetic

field is established.

- 9) An apparatus for treating, conditioning or purifying water or other fluid, the apparatus comprising a duct for the water or other fluid to flow through, a pair of electrodes spaced apart across the duct, and drive means for applying a voltage across the electrodes consisting of a unidirectional component having superimposed on it an alternating component of frequency in the range of 50 to 60 hz.
- 10) A process for treating, conditioning or purifying water or other fluid, which comprises passing the water or other fluid through a flow duct whilst within the duct an axial magnetic field is created, said axial magnetic field having a unidirectional component and an alternating component of frequency in the range of 50 to 60 hz.
- 11) A process as claimed in claim 9, in which said unidirectional magnetic field is created by passing a direct current through a coil wound or positioned around the flow duct.
- 12) A process as claimed in claim 9, in which the flow duct is aligned with the earth's magnetic field to establish said unidirectional magnetic field within the duct.
- 13) A process for treating, conditioning or purifying water or other fluid, which comprises passing the water or other fluid through a flow duct whilst within the duct a transverse electric field is created, the transverse magnetic field having a unidirectional component and an alternating component of frequency in the range 50 to 60 hz.

-1/2-

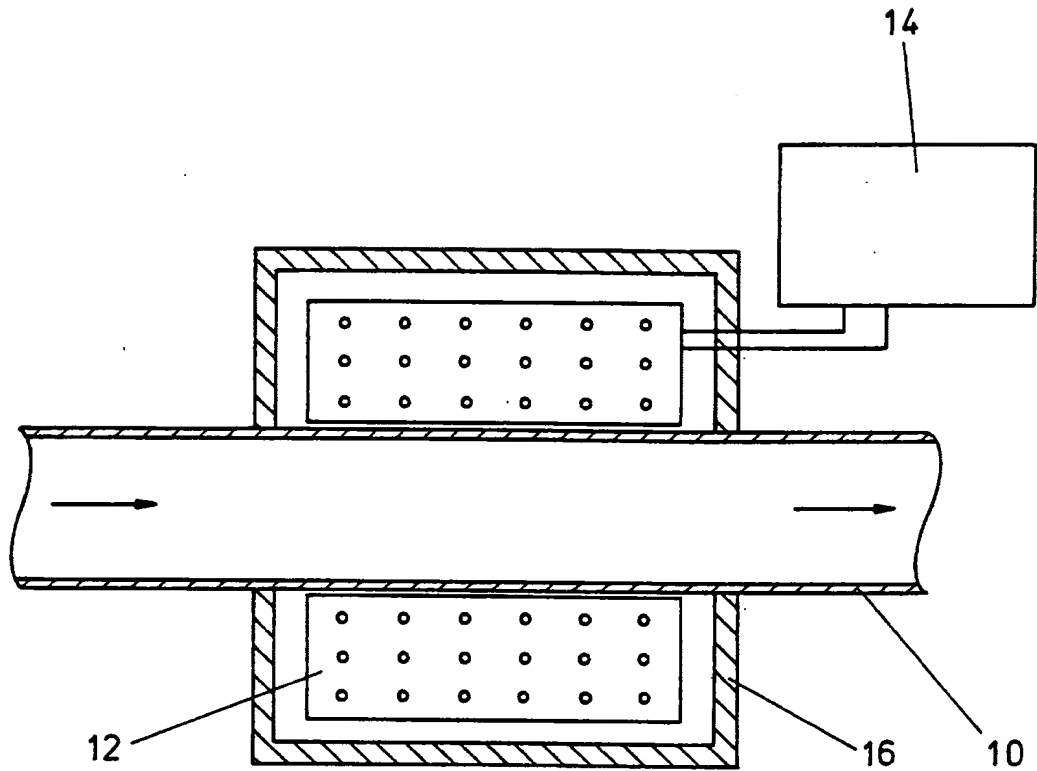


FIG. 1

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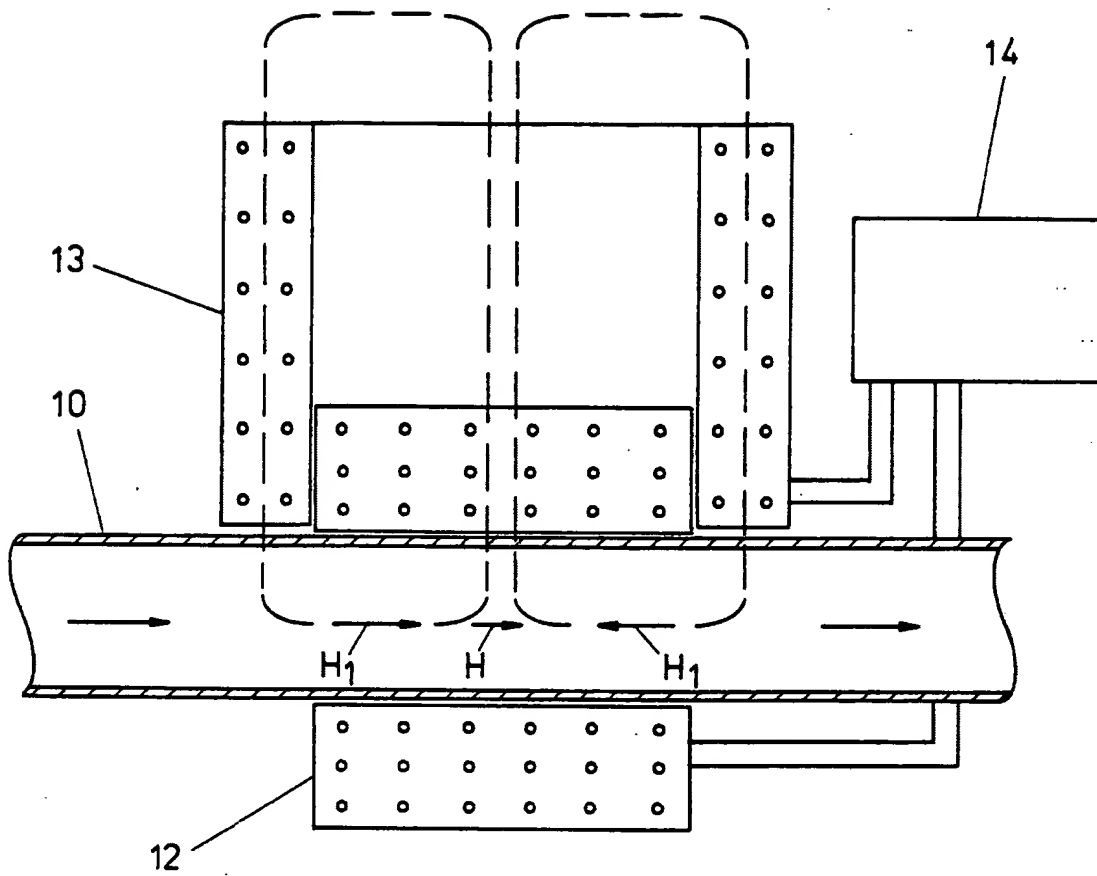


FIG. 2

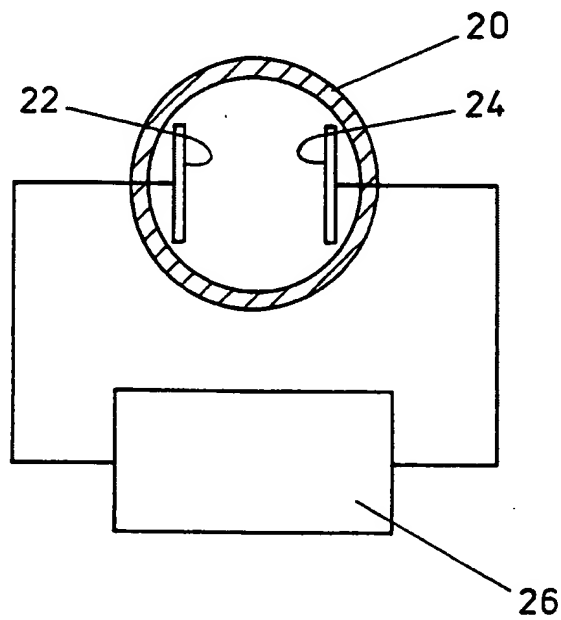


FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 92/01966

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 C02F1/48		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	C02F	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X,P	WO,A,9 206 042 (TARN PURE LIMITED) 16 April 1992 see page 2, paragraph 2 - page 3, paragraph 4 see page 4, paragraph 2 ---	1-3,6,7, 10,11
A	EP,A,0 357 102 (DE BAAT DOELMAN,J.P.) 7 March 1990 see column 2, line 31 - line 52 see column 5, line 43 - line 50; claims 1,2 ---	1-3,5,6
A	US,A,4 326 954 (L.L.SHROYER) 27 April 1982 see column 4, line 20 - line 31 see column 5, line 61 - column 6, line 68 ---	1-3,8,11
-/--		
<p>¹⁰ Special categories of cited documents :¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
23 FEBRUARY 1993	15. 03. 93	
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	BE,A,901 884 (P.E.H. NIESSEN) 6 September 1985 see the whole document ---	1,2,10
A	GB,A,892 628 (TRAFIKAKTIEBOLAGET GRANGESTERGOXELÖSUND) 28 March 1962 see the whole document -----	9,13

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
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GB 9201966
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-9206042	16-04-92	AU-A- 8638991	28-04-92
		GB-A- 2250221	03-06-92
EP-A-0357102	07-03-90	NL-A- 8802179	02-04-90
		US-A- 5074998	24-12-91
US-A-4326954	27-04-82	CA-A- 1164929	03-04-84
BE-A-901884	06-09-85	None	
GB-A-892628		CH-A- 365343	
		FR-A- 1198385	
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